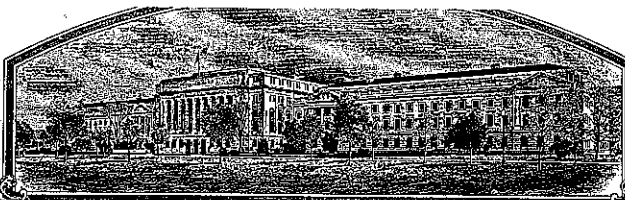


No.

9800369



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

South Dakota Agricultural Experiment Station

Whereas THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE FOREGOING PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Tandem'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty-third day of March, in the year of our Lord two thousand one.

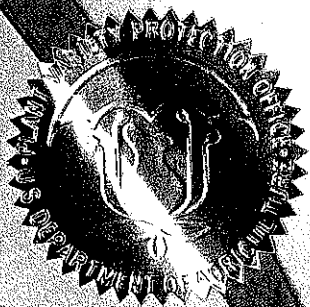
Attest:

Alvin H. Post

Acting Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

[Signature]

Secretary of Agriculture



U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

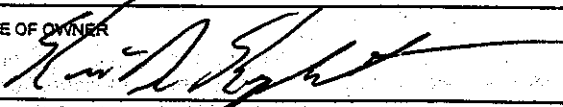
1. NAME OF OWNER South Dakota State Agricultural Experiment Station		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME SD89119		3. VARIETY NAME Tandem	
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) South Dakota State University Ag Hall 129 Brookings SD 57007		5. TELEPHONE (Include area code) 605-688-4149		FOR OFFICIAL USE ONLY	
		6. FAX (Include area code) 605-688-6065		PVPO NUMBER 9800369	
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) Agricultural Experiment Station		8. IF INCORPORATED, GIVE STATE OF INCORPORATION N/A		9. DATE OF INCORPORATION N/A	
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) Dr. Kevin Kephart, Director SD Ag. Exp. Station, Box 2207 South Dakota State University Brookings SD 57007				FILING AND EXAMINATION FEES: \$ 2450.00 DATE 8-27-98 CERTIFICATION FEE: \$ 320.00 DATE 3-19-01	
11. TELEPHONE (Include area code) 605-688-4453		12. FAX (Include area code) 605-688-4452		13. E-MAIL Amir_Ibrahim@sdstate.edu	
14. CROP KIND (Common Name) Hard Red Winter Wheat					
15. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)		19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act			
a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,705), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)		YES (If "yes", answer items 20 and 21 below) <input checked="" type="checkbox"/> NO (If "no," go to item 22) <input type="checkbox"/> 20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED 21. DOES THE OWNER SPECIFY THAT THE CLASSES BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, SPECIFY THE NUMBER 1, 2, 3, etc. <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED (If additional explanation is necessary, please use the space indicated on the reverse.)			
22. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input checked="" type="checkbox"/> YES U.S.A. Sept 1, 1997 <input type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)		23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)			
The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.					
SIGNATURE OF OWNER 		SIGNATURE OF OWNER			
NAME (Please print or type) Dr. Kevin Kephart		NAME (Please print or type)			
CAPACITY OR TITLE Director, SD Ag Exp Station		DATE 02/8/01		CAPACITY OR TITLE	
		DATE			

EXHIBIT A
Tandem (SD89119)
Origin and Breeding History of the Variety

Tandem was selected as an F_{5.6} line from the cross 'Brule'/'Agate' made in 1983. The cross (coded X83235) was advanced to the F₅ generation with a bulk breeding procedure. The F₁ plants were grown in the greenhouse in Brookings, South Dakota in 1984 and advanced to the F₂ generation without deliberate selection. The F₂ populations were grown in Brookings and Highmore, South Dakota and selections were made based on grain yield, test weight, pedigree, disease resistance, maturity, plant height, and resistance to lodging. The F₃ generation was grown in Brookings and Dakota Lakes Research Farm near Pierre, South Dakota, and about 100 heads were picked from the most promising populations using the same traits with which the F₂ bulks were advanced. The head rows were planted in Dakota Lakes Research Farm near Pierre, South Dakota in 1988 and selection among these rows was done based on maturity, pedigree, and resistance to lodging and diseases. Tandem was identified as experimental line SD89119 in 1989. Tandem was then grown in the early yield trial in Brookings, Selby, and Winner, South Dakota. Selection at this generation was based on yield, test weight, disease resistance, and quality characteristics. The most promising lines were advanced to the preliminary yield trial (5 locations) and then the advanced yield trial the following year (6 locations).

Tandem (SD89119) has been tested in advanced yield trials of the South Dakota Winter Wheat Breeding Program since 1992, the South Dakota Crop Performance Testing (CPT) Variety Trial since 1993, and the Northern Regional Performance Nursery (NRPN) from 1993 to 1995. Tandem was also tested in the Wheat Quality Council Small-Scale Testing program in 1995 and 1996. Breeder seed, produced in 1995-1996, originated from a composite of approximately 600 F₁₁-derived head-rows selected as part of a glume-color purification program in 1994-1995. Foundation seed was produced in 1996-1997.

Tandem has been uniform and stable for all morphological characters such as plant height and earliness during the past four generations of selfing and increase. A tall (10 cm taller) bronze-chaffed variant was identified in the breeders seed at a frequency of approximately 0.04%. A tall (10 cm taller) white-chaffed variant was identified in the breeders seed at a frequency of approximately 0.05%. Up to 0.1% variant plants may be encountered in subsequent generations.

EXHIBIT B
Tandem (SD89119)
Statement of Distinctness

Tandem is most similar to the hard red winter wheat cultivar 'Arapahoe', but differs in the following characteristics:

- 1) **Test Weight:** Tandem has 1.4 LB/Bu more test weight than Arapahoe, when recorded directly from the combine (Table 1).
- 2) **Peduncle Length:** Tandem has a shorter (12.1 ± 0.4 mm; n=20) peduncle than Arapahoe (15.9 ± 0.5 mm; n=20).
- 3) **Kernel Weight:** Tandem (33.9 ± 0.7 mg kernel⁻¹; n=10) has larger kernels than Arapahoe (28.5 ± 0.8 mg kernel⁻¹; n=10).
- 4) **Polyacrylamide Gel Electrophoresis (PAGE):** Polyacrylamide Gel Electrophoresis shows that Tandem and Arapahoe have distinctly different seed storage protein banding patterns (Photograph 1). The arrows on the photograph point to bands that are present in Tandem but missing in Arapahoe and vice versa.

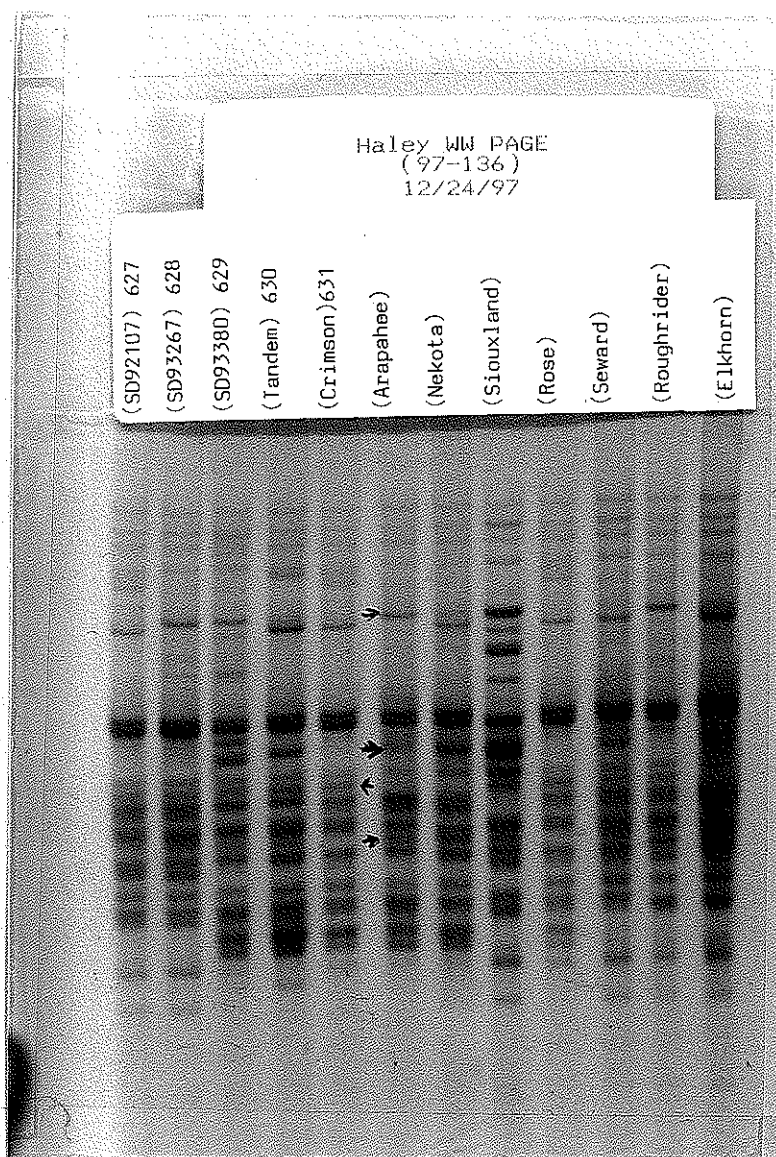
Davis, B. 1964. Disc electrophoresis. II. Method and application to human serum protein. Ann. New York Acad. Sci. 121:404-427.

Table 1. South Dakota State University, Winter Wheat Breeding Trials Combined Over Locations and Years.

	Grain Yield (bu/a)					Test Weight (lb/bu)					Heading (days)					Plant Height (inches)				
	94	95	96	97	94-97	94	95	96	97	94-97	94	95	96	97	94-97	94	95	96	97	94-97
	(12)	(11)	(8)	(5)	(36)	(12)	(11)	(8)	(5)	(36)	(2)	(5)	(1)	(3)	(11)	(8)	(11)	(8)	(4)	(31)
Arapahoe	42.0	50.3	58.8	61.9	51.0	60.1	59.7	59.9	58.3	59.7	157.6	164.4	164.8	165.1	163.4	26.6	33.8	32.7	33.6	31.6
Siouxland	37.0	47.4	57.6	55.6	47.4	59.9	59.6	60.4	58.7	59.8	157.1	165.1	163.8	164.5	163.4	28.7	37.3	34.9	37.3	34.5
Tandem	42.7	48.3	57.7	52.6	49.1	61.4	61.1	61.1	60.1	61.1	158.0	164.8	164.5	165.0	163.6	26.8	34.7	34.3	35.8	32.7
CV%	17.4	17.5	12.6	15.0	16.6	2.8	2.3	2.8	2.0	2.6	1.0	0.7	1.4	1.1	1.0	9.4	6.7	6.4	6.1	8.5
LSD (.05)	2.3	3.0	2.8	4.2	1.6	0.6	0.5	0.7	0.6	0.3	1.3	0.6	2.1	1.2	0.6	1.1	0.8	0.9	1.2	0.6

N.B.: Figures in parentheses indicate the number of locations that data was collected from.

Photograph 1. Acid polyacrylamide gel electrophoresis (PAGE) of hard red winter wheat cultivars Tandem, Arapahoe, and Siouxland. The Acid PAGE was conducted by Dr. Brent Turnipseed, Seed Testing Lab, Plant Science Department, South Dakota State University.



REPRODUCE LOCALLY. Include form number and date on all reproductions.

Form Approved - OMB No. 0581-0055

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this collection of information is (0581-0055). The time required to complete this information collection is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*Triticum* spp.)

NAME OF APPLICANT(S) South Dakota Agricultural Experiment Station	FOR OFFICIAL USE ONLY
ADDRESS (Street and No. or RD No., City, State, and Zip Code) South Dakota State University Ag Hall 129 Brookings, SD 57007	PVPO NUMBER 9800369
	VARIETY NAME Tandem
	TEMPORARY OR EXPERIMENTAL DESIGNATION SD89119

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. or) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used:
Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

1=Common 2=Durum 3=Club 4=Other (SPECIFY): _____

2. VERNALIZATION:

1=Spring 2=Winter 3=Other (SPECIFY): _____

3. COLEOPTILE ANTHOCYANIN:

1=Absent 2=Present

4. JUVENILE PLANT GROWTH:

1=Prostrate 2=Semi-erect 3=Erect

5. PLANT COLOR (boot stage):

1 = Yellow-Green 2 = Green 3 = Blue-Green

6. FLAG LEAF (boot stage):

1 = Erect 2 = Recurved 1 = Not Twisted 2 = Twisted

7. EAR EMERGENCE:

Number of Days Earlier Than Roughrider *

Number of Days Later Than Nekota *

8. ANTHOR COLOR:

☐ 1

1 = Yellow

2 = Purple

9. PLANT HEIGHT (from soil to top of head, excluding awns):

☐ 1 ☐ 0cm Taller Than Nekota *☐ 0 ☐ 7cm Shorter Than Roughrider *

* Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

10. STEM:

A. ANTHOCYANIN

☐ 1

1 = Absent

2 = Present

B. WAXY BLOOM

☐ 2

1 = Absent

2 = Present

C. HAIRINESS (last internode of rachis)

☐ 1

1 = Absent

2 = Present

D. INTERNODE (SPECIFY NUMBER)

☐ 1

1 = Hollow

2 = Semi-solid

3 = Solid

E. PEDUNCLE

☐ 2

1 = Absent

2 = Present

☐ 12

cm Length

11. HEAD (at Maturity):

A. DENSITY

☐ 2

1 = Lax

2 = Middense

3 = Dense

B. SHAPE

☐ 1

1 = Tapering

2 = Strap

3 = Clavate 4 = Other (SPECIFY): _____

C. CURVATURE

☐ 2

1 = Erect

2 = Inclined

3 = Recurved

D. AWNEDNESS

☐ 4

1 = Awnless

2 = Apically Awnletted

3 = Awnletted

4 = Awned

12. GLUMES (at Maturity):

A. COLOR

☐ 1

1 = White

2 = Tan

3 = Other (SPECIFY): _____

C. BEAK

☐ 3

1 = Obtuse

2 = Acute

3 = Acuminate

B. SHOULDER

☐ 4

1 = Wanting

2 = Oblique

3 = Rounded

4 = Square

5 = Elevated

6 = Apiculate

D. LENGTH

☐ 1

1 = Short

2 = Medium

(ca. 7mm)

(ca. 8mm)

3 = Long (ca. 9mm)

12. GLUMES (at Maturity) *Continued*:

E. WIDTH

- ☐ 1 = Narrow (ca. 3mm) 2 = Medium (ca. 3.5mm)
☐ 3 = Wide (ca. 4mm)

13. SEED:

A. SHAPE

- ☐ 3 = 1 = Ovate 2 = Oval 3 = Elliptical

C. BRUSH

- ☐ 2 = 1 = Short 2 = Medium 3 = Long
☐ 1 = 1 = Not Collared 2 = Collared

B. CHEEK

- ☐ 1 = 1 = Rounded 2 = Angular

D. CREASE

- ☐ 2 = 1 = Width 60% or less of Kernel
 2 = Width 80% or less of Kernel
 3 = Width Nearly as Wide as Kernel
☐ 1 = 1 = Depth 20% or less of Kernel
 2 = Depth 35% or less of Kernel
 3 = Depth 50% or less of Kernel

E. Color

- ☐ 3 = 1 = White 2 = Amber 3 = Red
 4 = OTHER (Specify)

G. PHENOL REACTION (*see instructions*):

- ☐ 1 = Ivory 2 = Fawn
 3 = Light Brown 4 = Dark Brown
 5 = Black

F. TEXTURE

- ☐ 1 = 1 = Hard 2 = Soft

14. DISEASE: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

- | | |
|---|--|
| <input type="checkbox"/> 2 Stem Rust (<i>Puccinia graminis</i> f. sp. <i>tritici</i>) | <input type="checkbox"/> 1 Leaf Rust (<i>Puccinia recondita</i> f. sp. <i>tritici</i>) |
| <input type="checkbox"/> 0 Stripe Rust (<i>Puccinia striiformis</i>) | <input type="checkbox"/> 0 Loose Smut (<i>Ustilago tritici</i>) |
| <input type="checkbox"/> 1 Tan Spot (<i>Pyrenophora tritici-repentis</i>) | <input type="checkbox"/> 0 Flag Smut (<i>Urocystis agropyri</i>) |
| <input type="checkbox"/> 0 Halo Spot (<i>Selenophoma donacis</i>) | <input type="checkbox"/> 0 Common Bunt (<i>Tilletia tritici</i> or <i>T. laevis</i>) |
| <input type="checkbox"/> 0 <i>Septoria nodorum</i> (Glume Blotch) | <input type="checkbox"/> 0 Dwarf Bunt (<i>Tilletia controversa</i>) |
| <input type="checkbox"/> 0 <i>Septoria avenae</i> (Speckled Leaf Disease) | <input type="checkbox"/> 0 Karnal Bunt (<i>Tilletia indica</i>) |
| <input type="checkbox"/> 1 <i>Septoria tritici</i> (Speckled Leaf Blotch) | <input type="checkbox"/> 0 Powdery Mildew (<i>Erysiphe graminis</i> f. sp. <i>tritici</i>) |
| <input type="checkbox"/> 3 Scab (<i>Fusarium</i> spp.) | <input type="checkbox"/> 0 "Snow Molds" |

14. Disease (Continued) (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

<input type="checkbox"/> 0 "Black Point" (Kernel Smudge)	<input type="checkbox"/> 1 Common Root Rot (<i>Fusarium</i> , <i>Cochliobolus</i> and <i>Bipolaris</i> spp.)
<input type="checkbox"/> 0 Barley Yellow Dwarf Virus (BYDV)	<input type="checkbox"/> 0 Rhizoctonia Root Rot (<i>Rhizoctonia solani</i>)
<input type="checkbox"/> 0 Soilborne Mosaic Virus (SBMV)	<input type="checkbox"/> 0 Black Chaff (<i>Xanthomonas campestris</i> pv. <i>translucens</i>)
<input type="checkbox"/> 0 Wheat Yellow (Spindle Streak) Mosaic Virus	<input type="checkbox"/> 0 Bacterial Leaf Blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)
<input type="checkbox"/> 1 Wheat Streak Mosaic Virus (WSMV)	<input type="checkbox"/> Other (SPECIFY)
<input type="checkbox"/> Other (SPECIFY)	<input type="checkbox"/> Other (SPECIFY)
<input type="checkbox"/> Other (SPECIFY)	<input type="checkbox"/> Other (SPECIFY)
<input type="checkbox"/> Other (SPECIFY)	<input type="checkbox"/> Other (SPECIFY)

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

<input type="checkbox"/> 3 Hessian Fly (<i>Mayetiola destructor</i>)	<input type="checkbox"/> Other (SPECIFY)
<input type="checkbox"/> 0 Stem Sawfly (<i>Cephus</i> spp.)	<input type="checkbox"/> Other (SPECIFY)
<input type="checkbox"/> 0 Cereal Leaf Beetle (<i>Oulema melanopa</i>)	<input type="checkbox"/> Other (SPECIFY)
<input type="checkbox"/> 1 Russian Aphid (<i>Diuraphis noxia</i>)	<input type="checkbox"/> Other (SPECIFY)
<input type="checkbox"/> 1 Greenbug (<i>Schizaphis graminum</i>)	<input type="checkbox"/> Other (SPECIFY)
<input type="checkbox"/> 0 Aphids	<input type="checkbox"/> Other (SPECIFY)

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS

Exhibit D
Tandem (SD89119)
Additional Description of the Variety

The following additional descriptive information is presented:

- 1) Release notice of Tandem.
- 2) Table 1: Yield, test weight, heading, and plant height data of Tandem in the South Dakota Crops Performance Testing (CPT) variety trial.
- 3) Table 2: Yield performance data of Tandem in the South Dakota Crops Performance Testing (CPT) variety trial at individual locations.
- 4) Table 3: Test weight data of Tandem in the South Dakota Crops Performance Testing (CPT) variety trial.
- 5) Table 4: Agronomic and protein data of Tandem in the South Dakota Crops Performance Testing (CPT) variety trial.
- 6) Table 5: Milling and baking data of Tandem in the South Dakota Crops Performance Testing.

SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE UNIVERSITY
PLANT SCIENCE DEPARTMENT

Release of TANDEM Hard Red Winter Wheat

'Tandem' hard red winter wheat was developed by the South Dakota Agricultural Experiment Station and released to seed producers in the fall of 1997. Tandem is an awned, white-glumed, medium-maturity, standard height hard red winter wheat with excellent end-use quality characteristics and good yield performance in its maturity range. The name Tandem was chosen to highlight the combination of superior end-use quality in a yield-competitive agronomic package.

Tandem was selected (as an F_5 -derived line in the F_8 generation) from the cross 'Brule'/'Agate', made in 1983 by Dr. Jeffrey Gellner. Current breeder seed originated from a bulk of approximately 600 F_{11} -derived head-rows selected as part of a glume-color purification program in 1994-1995. Tandem was identified (as experimental line SD89119) in 1989 and has been tested in the South Dakota Crops Performance Testing (CPT) Variety Trial since 1993 and the Northern Regional Performance Nursery (NRPN) from 1993-1995. In five years of statewide testing in the South Dakota CPT (1993-1997; 46 environments), Tandem (52 bu/a) was 2 bushels lower yielding than Arapahoe (54 bu/a), but higher yielding than other cultivars in its maturity range, including Niobrara (51 bu/a), Siouxland (50 bu/a), and Dawn (48 bu/a). In western and northern South Dakota testing environments (18 environments), Tandem (57 bu/a) was the highest yielding entry, greater than Alliance (56 bu/a), Arapahoe (55 bu/a), Seward (55 bu/a), and Nekota (54 bu/a).

Tandem possesses several traits characteristic of excellent milling and baking performance. Over five years of testing in the South Dakota CPT, Tandem (60.7 lb/bu) exhibited very high and stable test weight characteristics with slightly lower test weight than Rose (60.8 lb/bu), but higher test weight than Roughrider (60.4 lb/bu), Scout 66 (60.2 lb/bu), and Arapahoe (59.2 lb/bu). Composite milling and baking data (provided by the USDA-ARS Hard Winter Wheat Quality Laboratory, Manhattan, KS) from the Northern Regional Performance Nursery (1993-1995) and the South Dakota Advanced Yield Trial (1994-1996) identified Tandem as a wheat with very large kernels with high kernel weight, very low flour ash, excellent flour extraction and high overall milling scores. Baking tests from these nurseries identified Tandem as a wheat with high flour protein, high water absorption with average mixing time, good mixing tolerance, and good loaf volume. Crumb grain characteristics from experimental and commercial baking tests have been rated as good.

In South Dakota, Tandem is a medium maturity wheat, heading 2 days earlier than Roughrider, similar to Arapahoe, and 3 days later than Nekota. Plant height of Tandem is medium, 3 inches shorter than Roughrider, 1 inch taller than Arapahoe, and 4 inches taller than Nekota. Tandem is moderately resistant to prevalent races of the stem rust pathogen (data provided by USDA-ARS Cereal Rust Laboratory, St. Paul, MN and the South Dakota State University Small Grains Pathology Program), susceptible to leaf rust, Tan spot, *Septoria* leaf blotch, and wheat streak mosaic virus. Tandem is heterogeneous for resistance to the Great Plains Biotype of Hessian Fly (data provided by USDA-ARS Plant Science and Entomology Research Unit, Manhattan, KS). The coleoptile length of Tandem is very long (94% of Scout 66) and the straw strength is medium (better than Scout 66, similar to Roughrider and Arapahoe). Available data suggest that the winterhardiness of Tandem is good.

The South Dakota Foundation Seed Division (Plant Science Department, South Dakota State University, Brookings, SD 57007) had foundation seed of Tandem available to qualified seed producers for planting in fall 1997. The seed classes will be breeder, foundation, registered, and certified. Tandem will be submitted for registration and plant variety protection under P.L. 910577 with the certification option.

Table 1. South Dakota State University, Winter Wheat Breeding Trials Combined over Locations and Years.

	Grain Yield (bu/a)						Test Weight (lb/bu)						Heading (days)						Plant Height (inches)					
	1994 (12)	1995 (11)	1996 (8)	1997 (5)	1997 (36)	1997 (36)	1994 (12)	1995 (11)	1996 (8)	1997 (5)	1997 (36)	1997 (36)	1994 (2)	1995 (5)	1996 (1)	1997 (3)	1997 (11)	1997 (11)	1994 (8)	1995 (11)	1996 (8)	1997 (4)	1997 (31)	1997 (31)
Alliance	41.3	55.5	54.0	56.2	50.5	59.2	59.6	59.7	59.2	56.9	59.2	59.2	157.0	162.5	160.5	163.6	161.6	161.6	25.0	32.8	29.8	31.0	29.8	29.8
Arapahoe	42.0	50.3	58.8	61.9	51.0	59.7	60.1	59.7	59.9	58.3	59.7	59.7	157.6	164.4	164.8	165.1	163.4	163.4	26.6	33.8	32.7	33.6	31.6	31.6
Crimson	43.5	47.3	56.4	56.0	49.3	61.7	61.9	61.8	61.7	60.7	61.7	61.7	160.0	166.1	165.3	165.6	164.8	164.8	27.7	36.1	34.3	35.6	33.4	33.4
Dawn	39.0	46.9	50.0	50.2	45.4	59.1	60.6	60.2	59.7	59.1	60.1	60.1	157.5	164.5	164.3	164.3	163.1	163.1	26.0	32.7	31.0	32.4	30.5	30.5
Nekota		53.8	54.4	59.8	55.3	60.5		61.0	60.8	59.1	60.5	60.5		163.0	162.3	163.1	162.9	162.9		32.0	29.0	30.9	30.8	30.8
Niobrara		51.7	54.1	52.4	52.6	58.5		59.2	58.3	57.1	58.5	58.5		163.2	163.8	165.6	164.1	164.1		34.2	32.0	33.6	33.3	33.3
Rose	41.1	45.3	55.9	52.1	47.2	61.1	61.0	61.3	61.5	60.5	61.1	61.1	160.1	166.3	166.0	166.1	165.1	165.1	28.2	36.1	35.2	35.1	33.7	33.7
Roughrider	36.5	35.8	57.3	50.7	42.9	60.6	90.6	60.4	61.8	59.4	60.6	60.6	162.1	167.5	167.0	168.3	166.7	166.7	31.3	38.2	39.1	40.4	37.0	37.0
Scout66	37.7	42.6	49.7	47.8	43.2	60.9	61.3	61.0	60.8	59.7	60.9	60.9	155.1	163.6	163.3	163.9	162.1	162.1	29.0	38.1	36.0	38.4	35.3	35.3
Seward	43.5	44.8	55.2	49.0	47.3	57.4	59.7	58.9	59.2	57.4	59.0	59.0	161.9	167.4	171.0	169.8	167.4	167.4	31.6	38.8	37.2	39.6	36.6	36.6
Siouxland	37.0	47.4	57.6	55.6	47.4	59.6	59.9	59.6	60.4	58.7	59.8	59.8	157.1	165.1	163.8	164.5	163.4	163.4	28.7	37.3	34.9	37.3	34.5	34.5
TAM 107	37.4	55.1	47.0	50.9	46.8	58.8	58.9	59.8	58.8	56.6	58.8	58.8	152.8	162.1	160.0	161.8	160.1	160.1	23.0	31.7	27.2	28.5	27.9	27.9
Tandem	42.7	48.3	57.7	52.6	49.1	61.1	61.4	61.1	61.1	60.1	61.1	61.1	158.0	164.8	164.5	165.0	163.6	163.6	26.8	34.7	34.3	35.8	32.7	32.7
Vista	40.9	50.6	48.4	57.5	47.9	59.3	59.7	59.8	58.7	58.2	59.3	59.3	156.9	163.4	162.3	164.2	162.3	162.3	23.4	30.6	27.8	29.2	27.8	27.8
CV %	17.4	17.5	12.6	15.0	16.6	2.6	2.8	2.3	2.8	2.0	2.6	2.6	1.0	0.7	1.4	1.1	1.0	1.0	9.4	6.7	6.4	6.1	8.5	8.5
LSD (.05)	2.3	3.0	2.8	4.2	1.6	0.3	0.6	0.5	0.7	0.6	0.3	0.3	1.3	0.6	2.1	1.2	0.6	0.6	1.1	0.8	0.9	1.2	0.6	0.6

Grain Yield Averages (5 Year) - Various Locations

TABLE 2

9800369

ID	Selby (YEARS) (4)	Wall (3)	Hayes (3)	Bison (4)	Platte (3)	Winner (5)	DLakes (3)	Martin (4)	Sturgis (2)	Oelrichs (4)	Brookings (3)	Watertown (3)	Highmore (2)	93-97 AVG
Arapahoe	71	49	46	52	47	45	46	61	65	64	51	51	60	54
Nekota	71	47	44	52	57	45	48	56	68	61	52	48	57	54
Alliance	70	50	46	58	51	46	42	59	72	65	46	48	57	54
SD89119	72	51	50	55	51	41	43	54	58	59	47	47	56	52
Niobrara	73	48	47	52	50	43	38	56	61	58	49	49	45	51
Vista	68	48	43	52	45	42	51	53	70	62	44	50	50	51
Siouxland	69	43	46	51	47	43	40	51	64	63	41	43	54	50
Rose	67	46	40	56	48	37	41	59	61	57	43	43	47	50
Seward	70	48	45	56	46	36	40	56	53	57	43	47	48	49
TAM 107	60	48	45	46	53	47	45	51	73	61	37	40	44	49
Dawn	64	47	40	53	44	38	39	55	65	60	44	45	43	48
Scout 66	61	41	44	51	41	35	40	51	52	55	35	38	47	45
Roughrider	61	39	41	51	41	33	36	52	46	54	40	37	49	45

TABLE 3

Test Weight Averages, 1993-1997

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ID	(LOCS)	1993 (14)	1994 (9)	1995 (10)	1996 (8)	1997 (5)	94-97 AVG (32)	93-97 AVG (46)
SD89153			62.4	61.8	61.7	60.6	61.6	61.6
Rose		59.1	61.7	61.3	61.4	60.5	61.2	60.8
SD89119		59.3	61.9	61.1	61.0	60.0	61.0	60.7
Roughrider		59.4	61.2	60.4	61.6	59.4	60.7	60.4
Nekota		60.0	61.2	61.0	60.5	59.1	60.4	60.3
Scout 66		58.0	61.6	61.0	60.5	59.7	60.7	60.2
Dawn		58.3	61.2	60.2	59.8	59.1	60.1	59.7
Arapahoe		58.0	60.4	59.7	59.6	58.3	59.5	59.2
Siouxland		56.9	60.4	59.6	60.2	58.7	59.7	59.2
Vista		57.8	60.3	59.8	58.6	58.2	59.2	58.9
Seward		58.4	59.7	58.9	59.2	57.4	58.8	58.7
Alliance		57.6	59.8	59.7	58.9	56.9	58.8	58.6
Niobrara			59.4	59.2	58.4	57.1	58.5	58.5
TAM 107		57.2	59.9	59.7	58.6	56.6	58.7	58.4

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TABLE 4

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Heading, plant height, lodging, coleoptile length, leaf spot score, and protein data for selected entries in the South Dakota Crops Performance Testing (CPT) Variety Trial.

Name	Heading (days)	Height (inches)	Lodging (score)	Coleoptile (% Scout66)	Leaf Spot (score)	Protein 1993	Protein 1994	Protein 1995	Protein 1996	Protein Average
Seward	171	42	2.5	86	3.3	12.0	12.0	11.5	12.5	12.0
Roughrider	167	41	5.3	106	1.5	12.5	13.4	13.0	13.8	13.2
Rose	166	39	3.3	103	1.8	12.6	13.0	12.2	13.6	12.9
SD89153	165	39	3.0	98	1.3	---	13.4	12.5	13.6	13.2
SD89119	165	38	5.0	94	2.8	12.5	13.2	12.6	14.3	13.2
Arapahoe	165	37	5.5	69	3.8	11.9	12.9	12.0	12.6	12.4
Siouxland	164	40	2.5	76	2.5	11.5	13.0	12.4	13.3	12.6
Nekota	162	34	1.8	74	2.5	12.2	12.8	12.4	13.2	12.7
Alliance	161	34	3.5	64	4.5	12.0	12.0	10.8	11.7	11.6
TAM 107	160	31	1.3	80	4.0	11.7	12.6	11.5	12.8	12.2

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Table 5. Quality parameters of selected lines grown in South Dakota environments and tested at the Hard Winter Wheat Quality Laboratory, USDA/ARS, Manhattan, KS.

ID	1995-1997						1995						1996						1997									
	KW	FY	ASH	MS	PRO	ABS	LV	KW	FY	ASH	MS	PRO	ABS	LV	KW	FY	ASH	MS	PRO	ABS	LV	KW	FY	ASH	MS	PRO	ABS	LV
Alliance	28.5	70.4	0.41	85	10.8	66.9	840	28.8	74.2	0.48	84	11.4	69.3	850	28.9	67.5	0.39	87	10.3	66.3	818	27.9	69.4	0.37	85	10.7	65.1	853
Arapahoe	27.9	69.9	0.48	80	11.8	66.8	854	26.9	74.2	0.55	78	12.8	70.1	875	27.9	65.3	0.49	76	11.3	65.9	818	28.9	70.1	0.41	86	11.4	64.4	868
Crimson	28.2	70.2	0.46	86	12.2	70.2	896	28.5	75.1	0.54	85	13.5	71.6	875	27.9	65.4	0.43	82	11.1	71.2	873	28.3	70.1	0.40	90	12.0	67.8	940
Rose	27.2	70.3	0.46	86	12.3	71.1	949	25.2	73.2	0.54	79	13.0	73.2	1020	27.8	68.1	0.45	90	11.8	68.8	883	28.5	69.5	0.40	90	12.2	71.2	943
Roughrider	29.1	71.2	0.55	78	12.6	69.2	939	26.6	76.0	0.63	76	13.3	71.8	935	29.5	67.5	0.54	74	11.8	69.6	888	31.3	70.1	0.47	86	12.6	66.3	993
Scout66	34.3	70.6	0.46	82	11.9	68.8	893	37.7	75.7	0.50	90	13.0	71.0	860	31.9	63.7	0.48	67	10.8	70.1	850	33.2	72.5	0.41	89	12.0	65.2	968
Seward	28.3	70.6	0.49	77	10.9	65.5	869	27.1	75.7	0.56	78	11.1	67.9	805	30.4	66.5	0.49	71	10.2	65.1	820	27.3	69.7	0.42	83	11.3	63.4	983
TAM 107	32.7	69.4	0.45	81	11.4	69.8	937	32.6	74.5	0.53	82	12.4	72.2	1010	35.2	65.1	0.44	78	10.5	70.1	865	30.3	68.5	0.39	83	11.4	67.2	935
Tandem	32.4	70.6	0.42	86	12.6	70.3	914	31.0	74.2	0.51	83	13.1	70.0	910	33.5	65.4	0.41	81	11.9	71.0	878	32.8	72.2	0.35	95	12.7	70.0	953
Vista	29.8	71.2	0.44	84	11.8	67.6	904	30.5	75.7	0.53	81	12.7	72.2	950	31.6	67.0	0.42	83	11.1	67.0	840	27.3	70.8	0.38	89	11.5	63.7	923
Nursery Mean								28.8	73.7	0.53	82	12.7	72.2	930	29.4	65.1	0.46	76	11.0	67.9	838	28.9	69.8	0.42	85	11.8	66.6	922
Nursery St. Dev.								2.7	1.5	0.03	4	0.6	1.7	56	1.9	1.7	0.04	5	0.6	2.3	39	2.2	2.0	0.03	4	0.6	20.0	41
Nursery C.V. %								9.3	2.0	5.64	5	4.6	2.3	6	6.6	2.6	0.46	7	5.7	3.4	5	7.7	2.8	7.43	5	4.8	3.0	4
Subset Mean	29.8	70.4	0.46	83	11.8	68.6	899	29.5	74.9	0.54	82	12.6	70.9	909	30.5	66.2	0.45	79	11.1	68.5	853	29.6	70.3	0.40	87	11.8	66.4	936
Subset LSD (.05)	2.7	1.8	0.02	7	0.5	2.1	61																					
Subset C.V. %	6.4	1.8	3.50	6	2.7	2.1	5																					

KW = Single kernel weight (mg); FY = Flour yield (percent of total product); ASH = Flour ash (percent at 14 % moisture basis); MS = Milling Score (100 point scale); PRO = Flour protein (percent at 14.0 % moisture basis); ABS = Bake absorption (14 % moisture basis); LV = Loaf volume.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY DIVISION - PLANT VARIETY PROTECTION OFFICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

The following statements are made in accordance with the Privacy Act 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) South Dakota Agricultural Experiment Station	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER .SD89119	3. VARIETY NAME Tandem
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) South Dakota State University Ag Hall 129 Brookings, SD 57007	5. TELEPHONE (include area code) 605-688-4149	6. FAX (include area code) 605-688-6065
7. PVPO NUMBER 9800369		
8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain. <div style="text-align: right;"><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</div>		
9. Is the applicant (individual or company) a U.S. national or U.S. based company? If no, give name of country <div style="text-align: right;"><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</div>		
10. Is the applicant the original breeder? If no, please answer the following: <div style="text-align: right;"><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</div>		
a. If original rights to variety were owned by individual(s): Is (are) the original breeder(s) a U.S. national(s)? If no, give name of country		
b. If original rights to variety were owned by a company: Is the original breeder(s) U.S. based company? If no, give name of country <div style="text-align: right;"><input type="checkbox"/> YES <input type="checkbox"/> NO</div>		
11. Additional explanation on ownership (If needed, use reverse for extra space):		

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original breeder, both the original breeder and the applicant must meet one of the above criteria.

The original breeder may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

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